

Chapter 1: Graphs

1.1a Rectangular Coordinates; Graphing Utilities; Introduction to Graphing Equations

Vocabulary:

- | | |
|--|---------------------------------------|
| <input type="checkbox"/> Axis | <input type="checkbox"/> Coordinates |
| <input type="checkbox"/> Origin | <input type="checkbox"/> Plot a Point |
| <input type="checkbox"/> Rectangular (Cartesian) Coordinate System | <input type="checkbox"/> Abscissa |
| <input type="checkbox"/> Ordered Pair | <input type="checkbox"/> Ordinate |
| | <input type="checkbox"/> Quadrants |

Objective 1: Use the Distance Formula

Distance Formula

The distance between two points $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$, denoted by $d(P_1, P_2)$, is

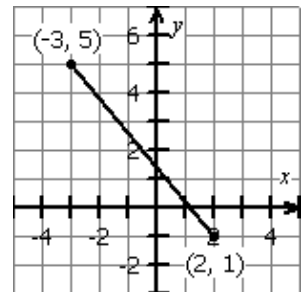
$$d(P_1, P_2) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Ex 2. Finding the Distance between Two Points

Find the distance d between two points $(-3, 4)$ and $(1, 7)$.

Ex 3. Finding the Length of a Line Segment

Find the length of the line segment in the figure to the right.



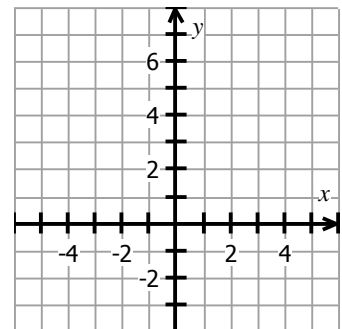
Ex 4. Using Algebra to Solve Geometry Problems

Consider the three points $A = (-2, 0)$, $B = (1, -2)$, and $C = (2, 6)$.

(a) Plot each point on the graph to the right and form the triangle ABC.

(b) Find the length of each side of the triangle.

(c) Verify that the triangle is a right triangle.



(d) Find the area of the triangle.

Objective 2: Use the Midpoint Formula

Midpoint Formula

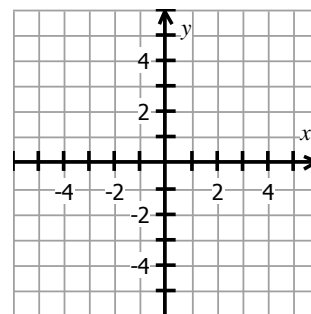
The midpoint $M = (x, y)$ of the line segment from $P_1 = (x_1, y_1)$ to $P_2 = (x_2, y_2)$ is

$$M = (x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Ex 5. Finding the Midpoint of a Line Segment

Find the midpoint of the line segment from $P_1 = (-4, -3)$ to $P_2 = (2, 5)$.

Plot the points P_1 and P_2 and their midpoint.



Objective 3: Graph Equations by Hand by Plotting Points

Ex 6. Determining Whether a Point Is on the Graph of an Equation

Note: Any values of x and y that result in a true statement are said to satisfy the equation and therefore, the point, (x, y) pair, is on the graph.

Determine if the following points are on the graph of the equation $3x - 2y = 12$.

(a) $(4, 3)$

(b) $(2, -3)$

Try: Determine if the following points are on the graph of the equations $y = x^3 + x^2 + 1$

(a) $(-1, 2)$

(b) $(1, 3)$

Read p.2 to 4 for vocabulary and introduction to graphing utilities including Example 1.

Graphing calculators will be used regularly in this course.

HW: 1-1a Pg 14-15 # 1-10all 32-70 x3

1.1 Assess Your Understanding

'Are You Prepared?' Answers are given at the end of these exercises. If you get a wrong answer, read the pages listed in red.

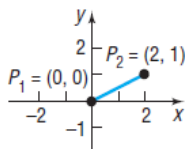
- On a real number line the origin is assigned the number _____. (p. A4)
- If -3 and 5 are the coordinates of two points on the real number line, the distance between these points is _____. (pp. A5–A6)
- If 3 and 4 are the legs of a right triangle, the hypotenuse is _____. (pp. A13–A14)
- Use the converse of the Pythagorean Theorem to show that a triangle whose sides are of lengths 11 , 60 , and 61 is a right triangle. (p. A14)
- The area of a triangle whose base is b and whose altitude is h is $A =$ _____. (p. A15)
- True or False** Two triangles are congruent if two angles and the included side of one equals two angles and the included side of the other. (pp. A16–A17)

Concepts and Vocabulary

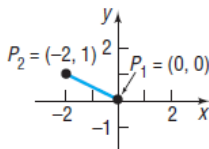
- If (x, y) are the coordinates of a point P in the xy -plane, then x is called the _____ of P and y is the _____ of P .
- The coordinate axes divide the xy -plane into four sections called _____.
- If three distinct points P , Q , and R all lie on a line and if $d(P, Q) = d(Q, R)$, then Q is called the _____ of the line segment from P to R .
- True or False** The distance between two points is sometimes a negative number.
- True or False** The point $(-1, 4)$ lies in quadrant IV of the Cartesian plane.
- True or False** The midpoint of a line segment is found by averaging the x -coordinates and averaging the y -coordinates of the endpoints.

In Problems 33–44, find the distance $d(P_1, P_2)$ between the points P_1 and P_2 .

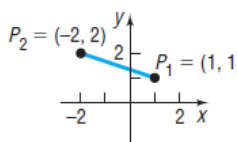
33.



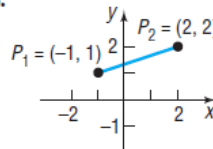
34.



35.



36.



37. $P_1 = (3, -4)$; $P_2 = (5, 4)$

39. $P_1 = (-5, -3)$; $P_2 = (11, 9)$

41. $P_1 = (4, -3)$; $P_2 = (6, 4)$

43. $P_1 = (a, b)$; $P_2 = (0, 0)$

38. $P_1 = (-1, 0)$; $P_2 = (2, 4)$

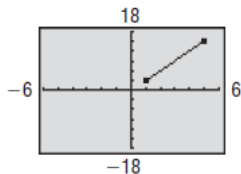
40. $P_1 = (2, -3)$; $P_2 = (10, 3)$

42. $P_1 = (-4, -3)$; $P_2 = (6, 2)$

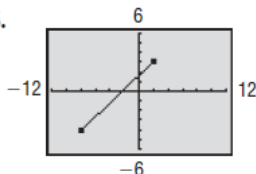
44. $P_1 = (a, a)$; $P_2 = (0, 0)$

In Problems 45–48, find the length of the line segment. Assume that the endpoints of each line segment have integer coordinates.

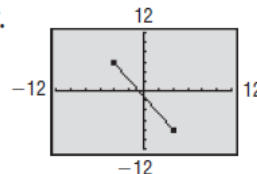
45.



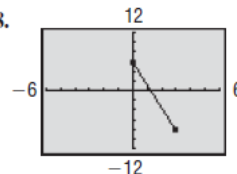
46.



47.



48.



In Problems 49–54, plot each point and form the triangle ABC . Verify that the triangle is a right triangle. Find its area.

49.

$A = (-2, 5)$; $B = (1, 3)$; $C = (-1, 0)$

50. $A = (-2, 5)$; $B = (12, 3)$; $C = (10, -11)$


51. $A = (-5, 3)$; $B = (6, 0)$; $C = (5, 5)$

52. $A = (-6, 3)$; $B = (3, -5)$; $C = (-1, 5)$

53. $A = (4, -3)$; $B = (0, -3)$; $C = (4, 2)$

54. $A = (4, -3)$; $B = (4, 1)$; $C = (2, 1)$

In Problems 55–62, find the midpoint of the line segment joining the points P_1 and P_2 .

 55. $P_1 = (3, -4)$; $P_2 = (5, 4)$

56. $P_1 = (-2, 0)$; $P_2 = (2, 4)$

57. $P_1 = (-5, -3)$; $P_2 = (11, 9)$

58. $P_1 = (2, -3)$; $P_2 = (10, 3)$


59. $P_1 = (4, -3)$; $P_2 = (6, 1)$

60. $P_1 = (-4, -3)$; $P_2 = (2, 2)$

61. $P_1 = (a, b)$; $P_2 = (0, 0)$

62. $P_1 = (a, a)$; $P_2 = (0, 0)$

In Problems 63–68, tell whether the given points are on the graph of the equation.

 63. Equation: $y = x^4 - \sqrt{x}$
Points: $(0, 0)$; $(1, 1)$; $(-1, 0)$

64. Equation: $y = x^3 - 2\sqrt{x}$
Points: $(0, 0)$; $(1, 1)$; $(1, -1)$

65. Equation: $y^2 = x^2 + 9$
Points: $(0, 3)$; $(3, 0)$; $(-3, 0)$

66. Equation: $y^3 = x + 1$
Points: $(1, 2)$; $(0, 1)$; $(-1, 0)$

67. Equation: $x^2 + y^2 = 4$
Points: $(0, 2)$; $(-2, 2)$; $(\sqrt{2}, \sqrt{2})$

68. Equation: $x^2 + 4y^2 = 4$
Points: $(0, 1)$; $(2, 0)$; $\left(2, \frac{1}{2}\right)$